

2.0 PURPOSE & NEED

2.1 What is the purpose of the Proposed Action and why is it needed?

The purpose of the Holden Beach East End Shore Protection Project (Proposed Action) is to reduce or mitigate ongoing and chronic erosion at the East End of Holden Beach and to protect and secure public infrastructure, roads, homes, businesses, rental properties, beaches, recreational assets, and protective dunes.

The purpose of the Proposed Action, as defined in Chapter 1 and above, is to establish a comprehensive shoreline protection program, under the independent authority of the Town of Holden Beach, which will restore and maintain the East End beach and provide for the short- and long-term protection of residential structures, Town infrastructure, and recreational assets. The Proposed Action is needed to mitigate ongoing and chronic East End shoreline erosion, which is projected to continue for the foreseeable future and threatens residential structures, Town infrastructure, recreational assets, and natural resources. Furthermore, based on the increasing need for additional shore protection beyond that provided by federal beneficial use placements, and the trend of declining federal funding for nourishment projects, an independent shore protection program under the authority of the Town is needed to ensure that the East End shoreline will be adequately protected.

2.2 How has the Holden Beach shoreline been managed in the past?

Several projects are ongoing or planned by either the Town or the USACE – Wilmington District, Civil Works Program [Appendix D (ATM 2009)]. Appendix E (ATM 2011) provides additional information on past management strategies.

There are two principal reaches of the Holden Beach shoreline that have been historically nourished:

1. Central Reach (baseline Station 40+00 west to Station 270+00)
2. East End (Station 40+00 east to LFI) (proposed project area)

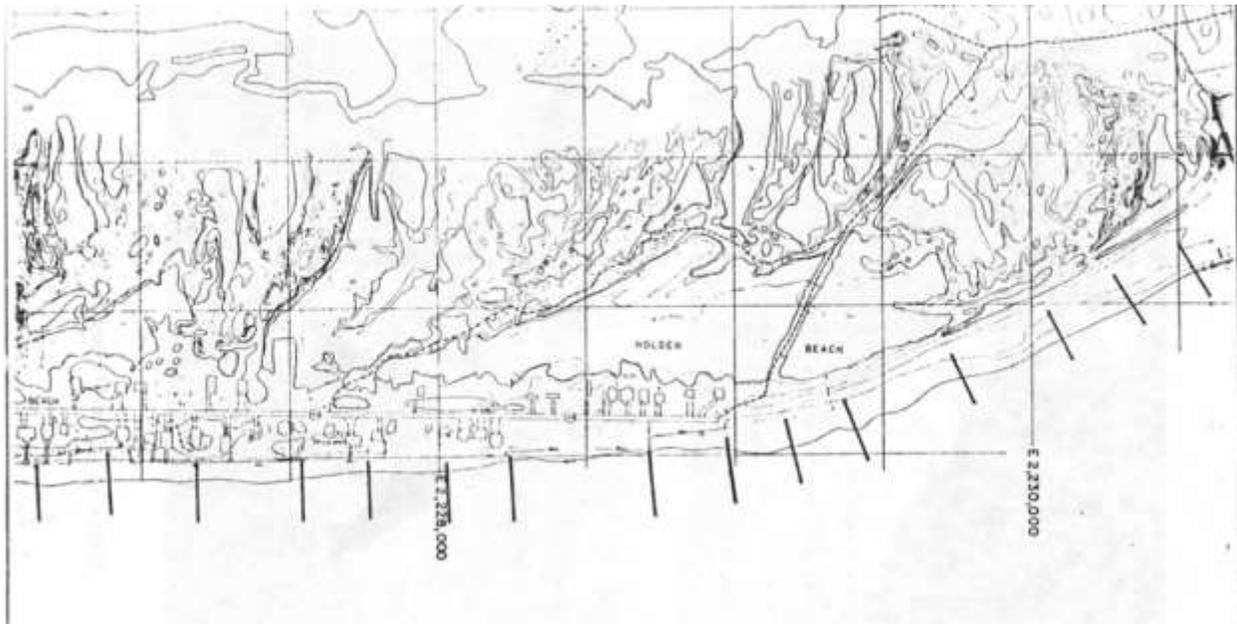
Figure 2.1 depicts these two reaches along with beach fill placements implemented by Holden Beach and USACE since 2001.



Figure 2.1. Central Reach and East End Reaches on Holden Beach with Beach Fill Placements since 2001.

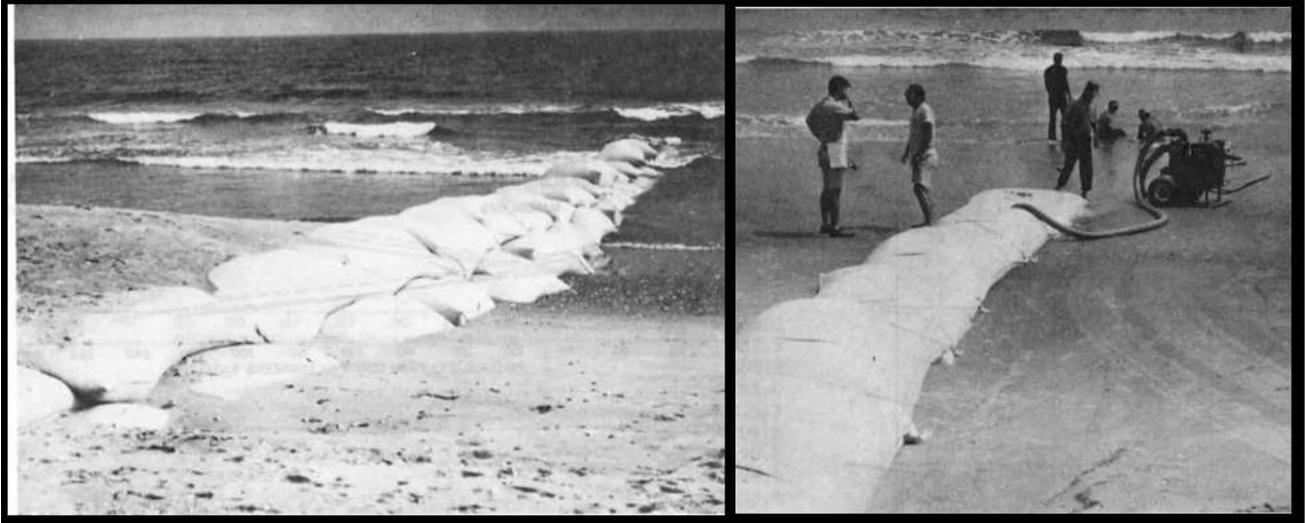
Due to the extreme erosion on the East End of Holden Beach, a temporary terminal groin field was constructed in the 1970s along the East End of Holden Beach. In general, terminal groins imply the placement of one groin. The other fundamental difference between a terminal groin and a groin field is that a terminal groin is placed at the end of a system and is designed to retain sand in the system.

The groin field project consisted of 15 sand-filled nylon tubes that were found to be beneficial in stabilizing dredged material from LFI (Machemehl 1975a). Figure 2.2 presents a layout of the 15 groins on the East end of Holden Beach. Figure 2.3 presents photos of the groins (Machemehl 1975b). While the groin field was successful and economical, the temporary nature of the nylon material and the lack of ongoing nourishment activities limited its long-term effectiveness. The Holden Beach Terminal Groin Work Plan (Appendix E) provides more discussion on this topic.



source: Machemehl 1975b

Figure 2.2. 1970s Groin Layout on East End of Holden Beach



source: Machemehl 1975b

Figure 2.3. Groin Construction and Placement in 1970s

As described in the Holden Beach Master Plan (ATM 2009; Appendix D), Town-sponsored projects have collectively placed 825,900 cubic yards (cy) of beach compatible material on the oceanfront shoreline, primarily to the east of station 110+00 (Figure 2.1.) This represents an annualized rate of 55,000 cubic yards per year (cy/yr) (see Table 2.1 below for details). Historically, the Town has not implemented beach fill projects on the East End, but instead has relied on USACE navigation maintenance dredging projects for East End sand placement. USACE AIWW beneficial use projects, as described in the Holden Beach Work Plan (ATM 2011; Appendix E) are primarily funded by the USACE, whereas the Town is typically responsible for 25 - 35 percent of the costs. The USACE is also responsible for permitting, design, construction, and monitoring of federal beneficial use projects. The 2001/2002 beach nourishment project along the central portion of Holden Beach (Section 933 Project) was sponsored by the USACE, with cost sharing by the Town, as a beneficial use of dredged material derived from the deepening of the Wilmington Harbor.

Town-fill placement projects are typically conducted in coordination with USACE East End fill placement events (Photo 2.1). For example, the Town's 2009 Central Reach nourishment project initiated beach fill placement where the USACE East End fill placement stopped (see Figure 2.1). Since 2002, the Town has not placed sand for beach berm construction purposes farther east than Station 40+00 due to high erosion rates reducing the economic benefit of each placement in this area. (see Table 2.1). The Town has performed limited dune restoration efforts on the East End in response to past emergency storm events (Photo 2.2).

Table 2.1. Town of Holden Beach nourishment summary over the last decade.

Date	Primary Sponsor	Baseline Stations Nourished	Approximate Volume of Material Placed (cubic yards)	Material Source
12/01 – 02/02	USACE	87+00 – 192+00	525,000	Wilmington Harbor Deepening Project
3/07/02 – 4/30/02	Town of Holden Beach (Phase I)	66+00 - 90+00, 175+00 – 217+00	141,800	Oyster Harbor upland site
03/02 – 04/02	USACE	20+00 – 30+00	32,000	AIWW Maintenance Dredging
Winter 2002-2003	Town of Holden Beach	90+00 – 175+00	30,000	Boyd Street Disposal Area
9/04 – 11/04	USACE	15+00 – 40+00	113,230	LFI AIWW
12/03 – 4/04	Town of Holden Beach (Phase II)	46+00 – 68+00, 215+00 – 238+00	123,000	Smith borrow site
5/05/06 – 5/24/06	USACE	15+00 – 40+00	62,853	LFI AIWW
Spring 2006	Town of Holden Beach	40+00-60+00	42,000	Smith borrow site
Spring 2006	Town of Holden Beach	260+00 – 262+00	3,200	Smith borrow site
1/08 – 3/08	Town of Holden Beach	60+00 – 95+00, 245+00 – 270+00	201,000	Smith borrow site
12/08 – 2/09	USACE	20+00 – 40+00	100,000	LFI AIWW
03/09 – 4/09	Town of Holden Beach	55+00 – 110+00, 210+00 – 255+00	190,000	Smith borrow site
04/10	USACE	20+00 – 55+00	140,000	LFI AIWW
02/11	USACE	20+00 – 40+00	32,000	LFI AIWW
01/12	USACE	20+00 – 30+00	25,000	LFI AIWW
02/14	USACE	18+00 – 50+00	93,000	LFI AIWW
2014	Town of Holden Beach	50+00 – 73+00	95,000	LFI AIWW
Approximate Total Volume since 2001			1,949,083	

Source: Holden Beach 2014 Annual Beach Monitoring Report (ATM 2014)

Photo 2.1. View to the east of a USACE beneficial use placement project in 2014.



Photo 2.2. View to the east of a USACE beneficial use placement project and dune restoration efforts in 2014.



Besides the Wilmington Harbor deepening, LFI and certain sections of the AIWW have provided sediment for USACE projects. LFI is a federally authorized navigation channel maintained by the USACE. Channel dredging is accomplished via pipeline, split-hull, or sidecast methods (Photo 2.3).

Photo 2.3. View of a USACE maintenance dredging event in the LFI AIWW crossing in 2014.



One of the primary goals of the Town's beach management strategy is to have no net reduction in sand volume along the entire length of Holden Beach. Additional goals aim to increase storm protection for upland infrastructure, increase recreational beach area, and/or address erosional hot spots.

2.3 What is the need for the Proposed Action?

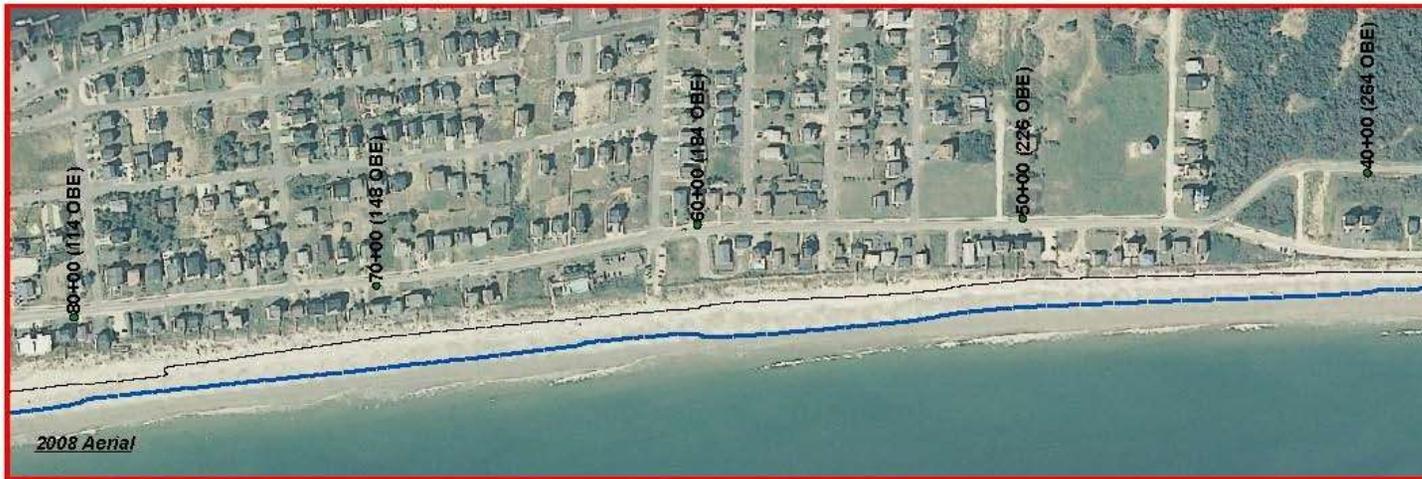
While the majority of the Holden Beach oceanfront shoreline has experienced long-term net erosion over the last 70 years, erosion has been most severe along the island's easternmost 2-mile reach bordering LFI. Average long-term erosion rates along the East End reach are among the highest in the state, ranging from -3 to -8 ft/yr (NCDCM 2011). Chronic erosion has contributed to dune breaching and flooding along the East End, most recently during Hurricane Hanna in 2008. Since 1993, East End erosion has resulted in the loss of approximately 27 oceanfront properties (including houses and infrastructure). Periodic nourishments by both the Town and the USACE have provided temporary shore protection benefits along the East End;

however, the rapid loss of placed sand to erosion necessitates repeated, costly nourishment events approximately every two years. To date, the Town's East End shore protection strategy has been one of reliance on frequent USACE beneficial use of dredged material projects that are funded primarily by the USACE; however, the long-term status of federal funding is precarious. Thus, a long-term, cost-effective, independent Town shore protection program is needed to combat chronic East End erosion.

As described in the Master Plan (ATM 2009; Appendix D), the primary cause of shoreline retreat along Holden Beach is due to long-term erosion through natural processes of littoral sediment transport, storm related recession and rise in sea level. Tidal currents, wave focusing and storage of sediment in the ebb and flood shoals of surrounding inlets (Shallotte and Lockwoods Folly) have also considerably affected the shoreline history of Holden Beach. Along the eastern end of the island, erosion has been prominent due to the continual shifting and reorientation of the main ebb and flood channel(s) of LFI. The result has been a starvation of sand along the eastern portion of the island which has caused an "erosional wave" propagating west. Net transport has been estimated to be ~228,000 cy/yr to the west (Thompson 1999).

As described in Section 2.2 above, the Town has been proactive in monitoring and maintaining their shoreline since 2001. Figure 2.4 presents a comparison of the 1993 and 2008 shorelines where the benefits of the Town's management activities can be seen. The Town has funded six truck haul beach nourishment projects ranging in volume from 30,000 to ~200,000 cy, placing unit volumes of 3.5 cy/ft to 35 cy/ft (Table 2.1). The recent projects have allowed the Town to keep pace with erosion in many areas (except for the eastern end). However, the process of placing additional sand must continue into the future to ensure the recreational and storm damage protection benefits of a wider sandy beach.

For some time now there has been a growing demand from the residents of Holden Beach, as well as in neighboring Supply, NC, for the Town to abandon truck haul projects and pursue alternate and/or offshore borrow sites. The Town has not been fully satisfied with upland borrow sources for the following reasons: 1) Sediment quality from upland sources; 2) Grain size: smaller mean grain size and larger percent fines affects project performance and life cycle; 3) Sediment Color: orange/red sediment has negative environmental impacts; 4) Slow production rates limit the scale of the nourishment projects; 5) Limitations on seaward placement/extent of fill; 6) Small scale projects typically not as cost effective or an efficient use of fill material; 7) Repeated small-scale projects may exacerbate environmental impacts; and 8) Frequent upland projects negatively impact traffic, roads, and tourism.



1993 and 2008 Aerial Comparison - East End



Figure 2.4. 1993 and 2008 Aerial Comparison – East End